

What is Claimed Is:

1. A method for patterning a carbon-containing substrate utilizing a patterned layer of a resist material as a mask and then safely removing said mask from said substrate without adversely affecting said substrate, said method comprising the sequential steps of:

- 5 (a) providing a substrate including a surface comprising carbon;
- (b) forming a thin metal layer on said substrate surface;
- (c) forming a layer of a resist material on said thin metal layer;
- (d) patterning said layer of resist material;
- (e) patterning said substrate utilizing the patterned layer of resist
- 10 material as a pattern-defining mask; and
- (f) removing said mask utilizing said thin metal layer as a wet strippable layer or as a plasma etch/ash stop layer.

2. The method according to claim 1, wherein:

step (a) comprises providing a substrate comprising a plurality of thin film layers covered by a carbon-containing protective overcoat layer.

3. The method according to claim 2, wherein:

step (a) comprises providing a thin film magnetic or magneto-optical (MO) recording medium and said carbon-containing protective overcoat layer comprises at least one material selected from amorphous hydrogenated and/or 5 nitrogenated carbon, ion-beam deposited (IBD) hydrogenated and/or nitrogenated carbon, plasma enhanced chemical vapor-deposited (PECVD) hydrogenated and/or nitrogenated carbon, and diamond-like carbon (DLC).

4. The method according to claim 1, wherein:

step (b) comprises forming an about 10 to about 200 Å thick layer of a material selected from the group consisting of Al, Cr, Zn, Cu, Ni, Ti, Co, Ge, Ge-Se, Al-Ti, Mg-Ag, Ca-Ag, and their oxides.

5. The method according to claim 1, wherein:

step (c) comprises forming a layer of a carbon-containing resist material.

6. The method according to claim 5, wherein:

step (c) comprises forming a layer of a thermoplastic resist material.

7. The method according to claim 1, wherein:

step (d) comprises forming a patterned plurality of recesses in the surface of said layer of resist material, said recesses extending at least partway through the thickness of said layer of resist material to define a corresponding plurality of portions of said substrate surface.

8. The method according to claim 7, wherein:

step (d) comprises subjecting said layer of resist material to at least one of thermal imprint lithography, wet chemical etching, and dry etching by means of ion irradiation.

9. The method according to claim 1, wherein:

step (e) comprises selectively removing substrate material from portions of said substrate defined by said mask.

10. The method according to claim 1, wherein:

step (e) comprises selectively ion irradiating or implanting the portions of said substrate defined by said mask to alter the magnetic properties thereof.

11. The method according to claim 1, wherein:

step (e) comprises forming a servo pattern in a magnetic or magneto-optical (MO) recording medium.

12. The method according to claim 1, wherein:

step (f) comprises removing said resist mask and said thin metal layer in a single step stripping process utilizing a wet chemical etchant for said thin metal layer which undercuts and lifts off said mask.

13. The method according to claim 12, wherein:

step (b) comprises forming a thin Al layer on said substrate surface; and  
step (f) comprises removing said mask and said thin metal layer in a single step stripping process utilizing an aqueous solution of a base.

14. The method according to claim 1, wherein:

step (f) comprises removing said mask and said thin metal layer in a two-step process comprising first removing said mask by means of a plasma etching/ashing process utilizing said thin metal layer as an etch stop layer and  
5 then removing said thin metal layer by means of a wet chemical removal process.

15. The method according to claim 14, wherein:

step (b) comprises forming a thin Al layer on said substrate surface; and  
step (f) comprises first removing said mask by ashing in an oxygen-containing plasma and then stripping said Al layer by washing with an aqueous  
5 solution of a base.

16. A method of manufacturing a patterned recording medium, comprising sequential steps of:

(a) providing a substrate in the form of a magnetic or magneto-optical (MO) recording medium, said medium comprising a stacked plurality of thin film  
5 layers including at least one magnetic recording layer and an uppermost, carbon-containing protective overcoat layer at the surface of said substrate, comprising at least one material selected from amorphous hydrogenated and/or nitrogenated carbon, ion-beam deposited (IBD) hydrogenated and/or nitrogenated carbon,

plasma enhanced chemical vapor-deposited (PECVD) hydrogenated and/or  
10 nitrogenated carbon, and diamond-like carbon (DLC);

(b) forming an about 10 to about 200 Å thick layer of a material selected from the group consisting of Al, Cr, Zn, Cu, Ni, Ti, Co, Ge, Ge-Se, Al-Ti, Mg-Ag, Ca-Ag, and their oxides on said uppermost, carbon-containing protective overcoat layer;

15 (c) forming a layer of a carbon-containing resist material on said thin metal layer;

(d) forming a patterned plurality of recesses in the surface of said layer of resist material, said recesses extending at least partway through the thickness of said layer of resist material to define a corresponding plurality of portions of said 20 substrate surface, wherein step (d) comprises subjecting said layer of resist material to at least one process selected from thermal imprint lithography, wet chemical etching, and dry etching by means of ion irradiation;

(e) patterning said substrate utilizing the patterned layer of resist material as a pattern-defining mask for forming a servo pattern in said medium, 25 wherein step (e) comprises selectively removing substrate material from portions of said substrate defined by said mask *or* selectively ion irradiating or implanting portions of said substrate surface defined by said mask to alter the magnetic properties thereof; and

(f) removing said mask and said thin metal layer in a single step 30 stripping process utilizing a wet chemical etchant for said thin metal layer which undercuts and lifts off said mask *or* removing said mask and said thin metal layer in a two-step process comprising first removing said mask by means of a plasma etching/ashing process utilizing said thin metal layer as an etch stop layer and then removing said thin metal layer by means of a wet chemical removal process.

17. The method according to claim 16, wherein:

step (b) comprises forming a thin Al layer on said substrate surface; and

step (f) comprises removing said mask and said thin metal layer in a single step stripping process utilizing an aqueous solution of a base.

18. The method according to claim 16, wherein:

step (b) comprises forming a thin Al layer on said substrate surface; and

step (f) comprises first removing said mask by ashing in an oxygen-containing plasma and then stripping said Al layer by washing with an aqueous  
5 solution of a base.

19. A structure for use in the manufacture of a patterned magnetic or magneto-optical (MO) recording medium, comprising:

(a) a substrate comprising a stacked plurality of thin film layers including at least one magnetic recording layer and an uppermost, carbon-containing protective overcoat layer at the surface of said substrate; and  
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(b) means for protecting said carbon-containing protective overcoat layer during resist removal therefrom as part of the process for manufacturing said patterned medium.

20. The structure as in claim 19, wherein:

said means (b) comprises an about 10 to about 200 Å thick layer of a metal selected from the group consisting of Al, Cr, Zn, Cu, Ni, Ti, Co, Ge, Ge-Se, Al-Ti, Mg-Ag, Ca-Ag, and their oxides on said uppermost, carbon-containing  
5 protective overcoat layer.